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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/681,276	10/09/2003	Takahiko Kawahara	33035M133	5971

441 7590 08/08/2005

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EXAMINER

MENEFEE, JAMES A

ART UNIT PAPER NUMBER

2828

DATE MAILED: 08/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/681,276

Applicant(s)

KAWAHARA ET AL.

Examiner

James A. Menefee

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 3-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 3-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10/9/2003
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Please note that the examiner of record for the case has changed. See correspondence information below under Conclusion.

All of the claims currently contain subject matter that was indicated as allowable in the prior action. However, the indicated allowability of the claims is withdrawn in view of the newly discovered art. Additionally, while this subject matter was previously indicated as allowable over Matsumoto, a new obviousness rejection is deemed appropriate.

Response to Amendment

In response to the amendment filed 6/27/2005, claims 1-2 are cancelled, claims 3-7, 9, and 12 are amended, and claims 13-20 are added. Claims 3-20 are pending.

Drawings

The replacement sheets were received on 6/27/2005. These drawings are acceptable.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not clear what scope is intended for the invention. The Fe concentration is claimed to be "at least $5 \times 10^{16} \text{ cm}^{-3}$ or less." However, "at least" allows for values greater than,

Art Unit: 2828

while “or less” allows for values less than, therefore this combination appears to broadly cover any concentration. In applicant’s remarks accompanying the amendment, applicant states that the claim is intended to mirror claim 12, but incorporate claim 6 therein. Therefore it is presumed the scope is intended to be $5 \times 10^{16} \text{ cm}^{-3}$ or less, similar to claim 6, and has been examined as such. If this is correct then “at least” should be deleted.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 3, 5-6, 9-10, 14, and 18-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Inaba et al. (US 6,678,299).

Regarding claims 5-6, Inaba discloses a semiconductor optical device comprising a semiconductor substrate 1 having a main surface, a stripe shaped waveguide 2-5 disposed on said main surface and including an active layer 3, a current blocking part 17 disposed on said semiconductor substrate including a blocking layer having InP doped with Fe at $5.0 \times 10^{16} \text{ cm}^{-3}$ (col. 5 line 66 – col. 6 line 7) having said waveguide buried therein, a conducting layer 9 formed on said waveguide and current blocking part, a first electrode 13 electrically connected to the substrate and a second electrode 12 electrically connected to the conductive layer and a trench having a bottom in contact with the current blocking part 17.

Art Unit: 2828

Note that $5.0 \times 10^{16} \text{ cm}^{-3}$ falls inside each of the claimed ranges (at least $5 \times 10^{15} \text{ cm}^{-3}$, $5 \times 10^{16} \text{ cm}^{-3}$ or less) and therefore anticipates both ranges. A specific example in the prior art falling within a claimed range anticipates that range. See MPEP 2131.03.

Regarding claims 3 and 14, the thickness of the blocking layer 17 is not explicitly disclosed; however, from the drawings this layer is clearly thicker than the combined thickness of layers 2-5. Given that the thickness of these layers is greater than $1 \mu\text{m}$ (col. 5 lines 21-39), the current blocking layer also be greater.

Regarding claims 9 and 18, the optical waveguide comprises first conductivity type semiconductor 2, active layer 3, and second conductivity type semiconductor layer 4.

Regarding claims 10 and 19, the device is a laser.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsumoto et al. (US 6,542,525) in view of Inaba.

Independent claims:

Regarding claims 5-6, Matsumoto discloses as in Figs. 8-9 a semiconductor optical device comprising a semiconductor substrate 12 having a main surface, a stripe shaped optical waveguide 96 disposed on said main surface and including an active layer 92, a current blocking

Art Unit: 2828

part 27 disposed on said substrate including a blocking layer 22 having InP doped with Fe and having said waveguide buried therein, an electrically conductive layer (either 18b or 28) disposed on said waveguide and blocking part, a first electrode 36 electrically connected to the substrate and a second electrode 88 electrically connected to the conductive layer, and a trench 5 having a bottom in contact with the blocking part. The Fe dopant concentration is not disclosed.

Regarding claims 12-13, Matsumoto discloses as in Figs. 2 and 8-9 a semiconductor optical integrated device comprising a semiconductor substrate 12 having a main surface including a laser region 86 and a modulation region 82 arranged in a predetermined direction, a stripe shaped first optical waveguide 96 longitudinally extending in the predetermined direction on the laser region, a second optical waveguide 20 longitudinally extending in the predetermined direction on the modulation region, a current blocking part 27 disposed on said substrate including a blocking layer 22 having InP doped with Fe and having both of said waveguides buried therein, an electrically conductive layer (either 18b or 28) disposed on said waveguide and blocking part in each of the regions, a first electrode 36 electrically connected to the substrate, a second electrode 88 electrically connected to the conductive layer on the laser region, and a third electrode 3a electrically connected to the conductive layer of the modulator region, a trench 5 extending in the predetermined directions and having a bottom in contact with the blocking part in both regions, each of the optical waveguides comprises first conductivity type semiconductor 14,90, active layer 16,92, and second conductivity type semiconductor layer 18a,94, the active layer between the two semiconductor layers. The Fe dopant concentration is not disclosed.

Art Unit: 2828

As noted, it is not disclosed that the Fe dopant concentration falls within the ranges as claimed. Matsumoto is totally silent as to the dopant concentration. One skilled in the art would surely recognize that there must be *some* dopant concentration; by definition the dopant must be included at some dopant concentration. So the question is: what concentration would one skilled in the art use? Matsumoto's layer 22 performs the function of current blocking, therefore one skilled in the art would have looked to prior art to see what type of dopant concentrations are used in InP current blocking layers doped with Fe. Inaba shows current blocking layers made of InP doped with Fe at concentrations within both of the claimed ranges. See the rejections above. It would have been obvious to one skilled in the art to choose the known dopant concentration because it has been shown to be effective in making such a layer current blocking, which is the entire purpose of the layer in Matsumoto.

Dependent claims:

Regarding claims 3 and 14, the blocking layer 22 has thickness over 1 μm . Col. 9 line 44.

Regarding claims 4 and 15, the current blocking part 27 further includes hole blocking layer 24 that is InP having conductivity opposite that of the conductive layer (n type vs. p type).

Regarding claims 7-8 and 16-17, an insulating film 32 made of a silicon compound is disposed on the surface of the trench. Col. 7 line 32.

Regarding claim 9 and 18, the optical waveguide 96 comprises first conductivity type semiconductor 90, active layer 92, and second conductivity type semiconductor 94, the active layer being between those two layers.

Regarding claims 10-11 and 19-20, the device may be a modulator or laser.

Response to Arguments

No arguments were made since all claims include subject matter that was previously allowed, namely the dopant concentrations.

In claim 5 the concentration of Fe is greater than 5×10^{15} , while in claim 6 the concentration is less than 5×10^{16} . Therefore a patent including these claims would cover all dopant concentrations. Claims 12 and 13 are similar. It is conceded that the previously cited reference to Matsumoto et al. does not disclose the dopant concentration of Fe (as indicated in the prior action). No concentration is disclosed. However, there must be *some* dopant concentration. It is not reasonable that applicant should expect to get a patent with claims covering all dopant concentrations when the prior art explicitly includes the claimed device at some unknown dopant concentration. Clearly Matsumoto would anticipate one of these claims, depending on what dopant concentration is actually used in the device. Of course, since Matsumoto contains no explicit disclosure of the concentration, and none can be said to be inherent, no anticipation rejection can be made. However the claims are now rejected as being obvious as noted above.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Each disclose current blocking layers of Fe doped InP at dopant concentrations falling within one or both of the claimed ranges. These references further buttress the examiner's contention that such layers are well known and obvious.

Art Unit: 2828

Akulova et al. (US 2003/0209771) discloses InP current blocking layers doped with Fe $1-3 \times 10^{18} \text{ cm}^{-3}$. Par. [0066].

Lentz et al. (US 2003/0194827) discloses InP current blocking layers doped with Fe $1-3 \times 10^{17} \text{ cm}^{-3}$. Par. [0044].

Bhat et al. (US 2002/0158314) discloses InP current blocking layers doped with Fe at $1 \times 10^{18} \text{ cm}^{-3}$. Pars. [0038], [0051].

Komori et al. (US 2001/0006529) discloses InP current blocking layers doped with Fe at $4 \times 10^{17} \text{ cm}^{-3}$. Par. [0041].

Geva et al. (US 6,706,542) discloses InP current blocking layers doped with Fe at $10^{16} - 10^{17} \text{ cm}^{-3}$. Col. 6 lines 37-43.

Shtengel et al. (US 6,556,605) discloses InP current blocking layers doped with Fe at $1-3 \times 10^{18} \text{ cm}^{-3}$. Col. 5 lines 8-20.

Takiguchi et al. (US 5,771,257) discloses InP current blocking layers doped with Fe at $4 \times 10^{16} \text{ cm}^{-3}$. Col. 1 line 48; col. 2 line 17. Takiguchi also discloses the device as an integrated modulator and laser.

Kimura et al. (US 5,452,315) discloses InP current blocking layers doped with Fe at $4 \times 10^{16} \text{ cm}^{-3}$. Par. bridging cols. 1 and 2.

Sugou et al. (US 4,815,083) discloses InP current blocking layers doped with Fe at $1 \times 10^{16} \text{ cm}^{-3}$. Col. 5 line 59.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Menefee whose telephone number is (571) 272-1944. The examiner can normally be reached on M-F 8:30-5.

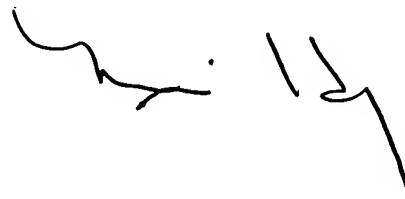
Art Unit: 2828

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MinSun Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



James Menefee
August 3, 2005



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